Remote Controlled HART® SMART™ Two-Wire Conductivity Transmitter

ESSENTIAL INSTRUCTIONS

Read this page before proceeding!

Your purchase from Rosemount Analytical, Inc. has resulted in one of the finest instruments available for your particular application. These instruments have been designed, and tested to meet many national and international standards. Experience indicates that its performance is directly related to the quality of the installation and knowledge of the user in operating and maintaining the instrument. To ensure their continued operation to the design specifications, personnel should read this manual thoroughly before proceeding with installation, commissioning, operation, and maintenance of this instrument. If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

- Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.
- Ensure that you have received the correct model and options from your purchase order. Verify that this manual covers your model and options. If not, call 1-800-854-8257 or 949-757-8500 to request correct manual.
- For clarification of instructions, contact your Rosemount representative.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Use only qualified personnel to install, operate, update, program and maintain the product.
- Educate your personnel in the proper installation, operation, and maintenance of the product.
- Install equipment as specified in the Installation section of this manual. Follow appropriate local and national codes. Only connect the product to electrical and pressure sources specified in this manual.
- Use only factory documented components for repair. Tampering or unauthorized substitution of parts and procedures can affect the performance and cause unsafe operation of your process.
- All equipment doors must be closed and protective covers must be in place unless qualified personnel are performing maintenance.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

⚠ WARNING

Substitution of components may impair Intrinsic Safety or suitability for Division 2.

⚠ WARNING

Do not remove or replace while circuit is live unless area is known to be non-hazardous.

⚠ WARNING

Explosion Hazard - Do not disconnect equipment unless area is known to be non-hazardous.

SPECIAL CONDITION FOR INTRINSICALLY SAFE USE

The 5081 enclosure is made of aluminum alloy and given a protective polyurethane finish; however, care must be taken to protect it from impact, abrasion or friction with other metal surfaces if located in zone 0.

⚠ WARNING

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or understand and adhere to the manufacturer's live maintenance procedures.

ROSEMOUNT® Analytical

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Specifications

PHYSICAL SPECIFICATIONS

Housing: Cast aluminum with epoxy coating. Type 4X (IP65). Neoprene O-ring cover seals. 160.5 mm x 175.3 mm x 161.3 mm (6.3 in. x 6.9 in. x 6.4 in.)

Diameter: 155.4 mm (6.1 in.)

Electrical Conduit Openings: 3/4 in. FNPT

Power Supply and Load: A minimum loop resistance (load) of 250 ohms and a minimum power supply of 18 volts DC is required for digital communication as shown in the load/power supply graph below.

Local Readout:
Main Display is 4 digits, 20 mm tall (0.8 in.)
Message Display is ten digits, 7 mm tall (0.3 in.)

Automatic Temperture Compensation
3-wire Pt100 RTD
Conductivity: 0 to 200 °C (32 to 392 °F)
% concentration: 0 to 100 °C (32 to 212°F)

Ambient temperature: -20 to 65° C (-4 to 149° F)

Relative Humidity: 0-95% with enclosure sealed.

CE: EMI/RFI certified: EN61326-1 CE

HAZARDOUS AREA CLASSIFICATION:

Intrinsic Safety:

FM APPROVED
Class I, II, III, Div. 1
Groups A-G
T4 Tamb = 70°C

Exia Entity
Class I, Groups A-D
Class II, Groups E-G
Class III
T4 Tamb = 70°C

IECEx BAS 09.0159X
Ex ia IIC T4 Ga

ATEX
CE 0600 II 1 G
Baseefa03ATEX0099
EEx ia IIC T4
Tamb = -20°C to +65°C

Non-Incendive:

FM APPROVED
Class I, Div. 2, Groups A-D
Dust Ignition Proof
Class II & III, Div. 1, Groups E-G
Type 4X Enclosure

Class I, Div. 2, Groups A-D
Suitable for Class II, Div. 2, Groups E-G
T4 Tamb = 70°C

Explosion-Proof:

FM APPROVED
Class I, Div. 1, Groups B-D
Class II, Div. 1, Groups E-G
Class III, Div. 1

Class I, Groups B-D
Class II, Groups E-G
Class III
Tamb = 65°C max

TRANSMITTER SPECIFICATIONS @ 25°C

Measured Range*: 50 to 2,000,000 µS/cm (see chart)

Accuracy: ± 1.0% of reading

Repeatability: ± 0.25% of reading

Stability: 0.25% of output range/month, non-cumulative

Ambient Temperature Coefficient: ± 0.2% of FS/°C

Compatible RTD: 100W with Automatic Recognition

Temperature Slope Adjustment: 0-5%/° C

% Concentration Ranges:

Sodium Hydroxide: 0 to 15%

Hydrochloric Acid: 0 to 16%

Sulfuric Acid: 0 to 25% and 96 to 99.7%

LOOP SPECIFICATIONS

Loop Accuracy: With a standard Model 228 or 225 sensor with 20' cable, laboratory accuracy at 25°C can be as good as ±2% of reading and ±50 µS/cm.

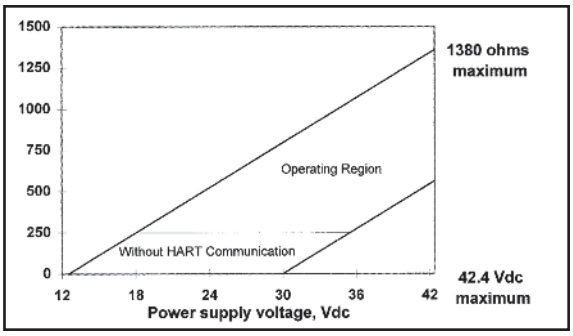
RECOMMENDED RANGES FOR TOROIDAL SENSORS						
Conductivity Sensor Model Number	226	228	225	222 (1in.)	222 (2 in.)	242
Nominal Cell Constant	1.0	3.0	3.0	6.0	4.0	*
Min. Conductivity (mS/cm)	50	200	200	500	500	100*
Max. Conductivity (mS/cm)	1,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000*

* Model 242 values depend on sensor configuration and wiring.

RECOMMENDED SENSORS:

222 Flow-Through
225 Clean-In-Place (CIP)
226 Submersion/Insertion
228 Submersion/Insertion/ Retractable
242 Flow-Through

242-06 or 242-08 with 5081T do not have Intrinsically Safe approvals.



To achieve optimum performance, standardize the sensor in the process at the conductivity and temperature of interest.

Results under real process conditions, at different temperatures, or using other sensors may differ from above.

RTD accuracy: Utilizing a perfect 100 Ohm RTD after 1 point temperature standardiztion, temperature reading can be as good as ±0.5°C.

TRANSMITTER DISPLAY DURING CALIBRATION AND PROGRAMMING (Figure 1)

1. Continuous display of conductivity, % concentration, or custom reading.
2. Units: µS/cm, mS/cm, ppm, %, or none.
3. Current menu appears here.
4. Submenus, prompts, and diagnostic readings appear here.
5. Commands available in each submenu or at each prompt appear here.
6. Hold appears when the transmitter is in hold.
7. Fault appears when the transmitter detects a sensor or instrument fault.
8. ♥ flashes during digital communication.

INFRARED REMOTE CONTROLLER (Figure 2)

1. Pressing a menu key allows the user access to calibrate, program, or diagnostic menus.
2. Press ENTER to store data and settings. Press NEXT to move from one submenu to the next. Press EXIT to leave without storing changes.
3. Use the editing keys to scroll through lists of allowed settings or to change a numerical setting to the desired value.
4. Pressing HOLD puts the transmitter in hold and sends the output current to a pre-programmed value. Pressing RESET causes the transmitter to abandon the present operation and return to the main display.

FIGURE 1. Transmitter display during calibration and programming. The program display screen allows access to calibration and programming menus.

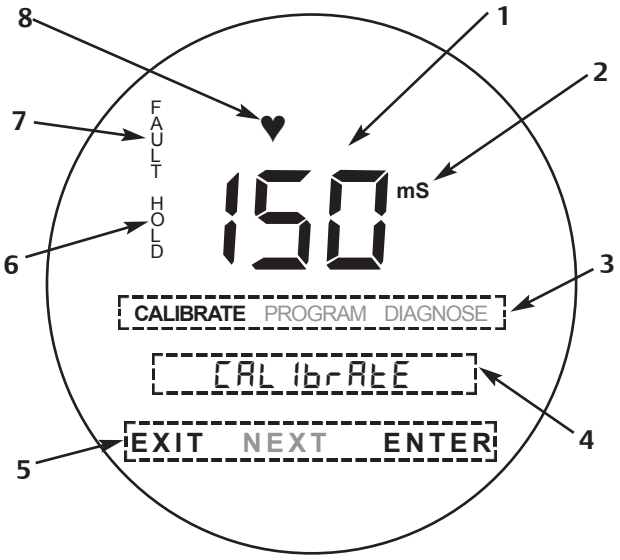


FIGURE 2. Infrared remote controller

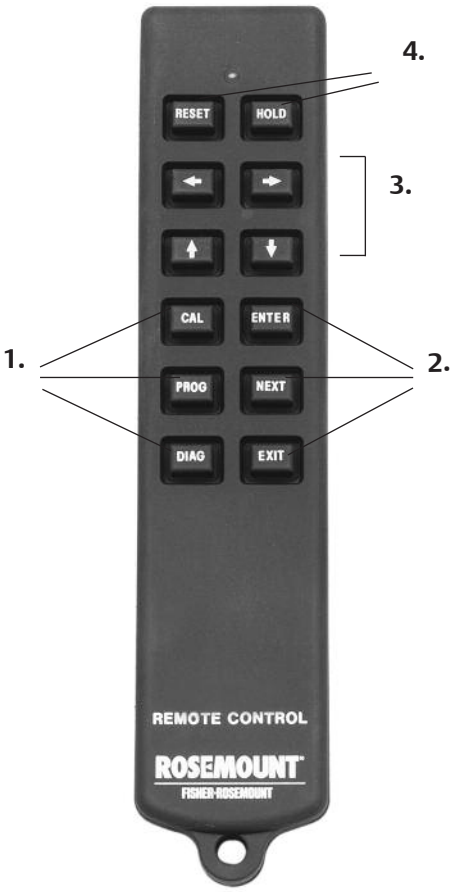
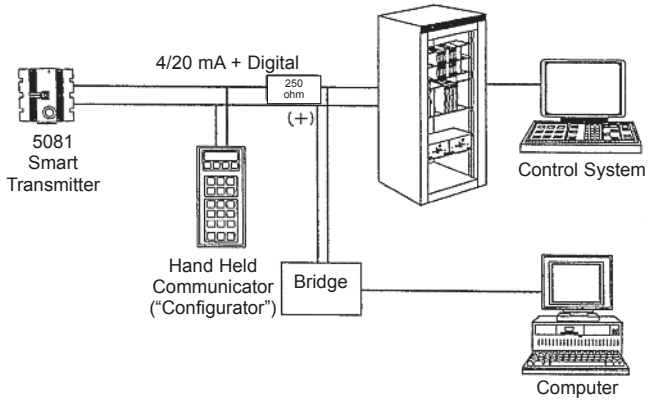


FIGURE 3. HART communication



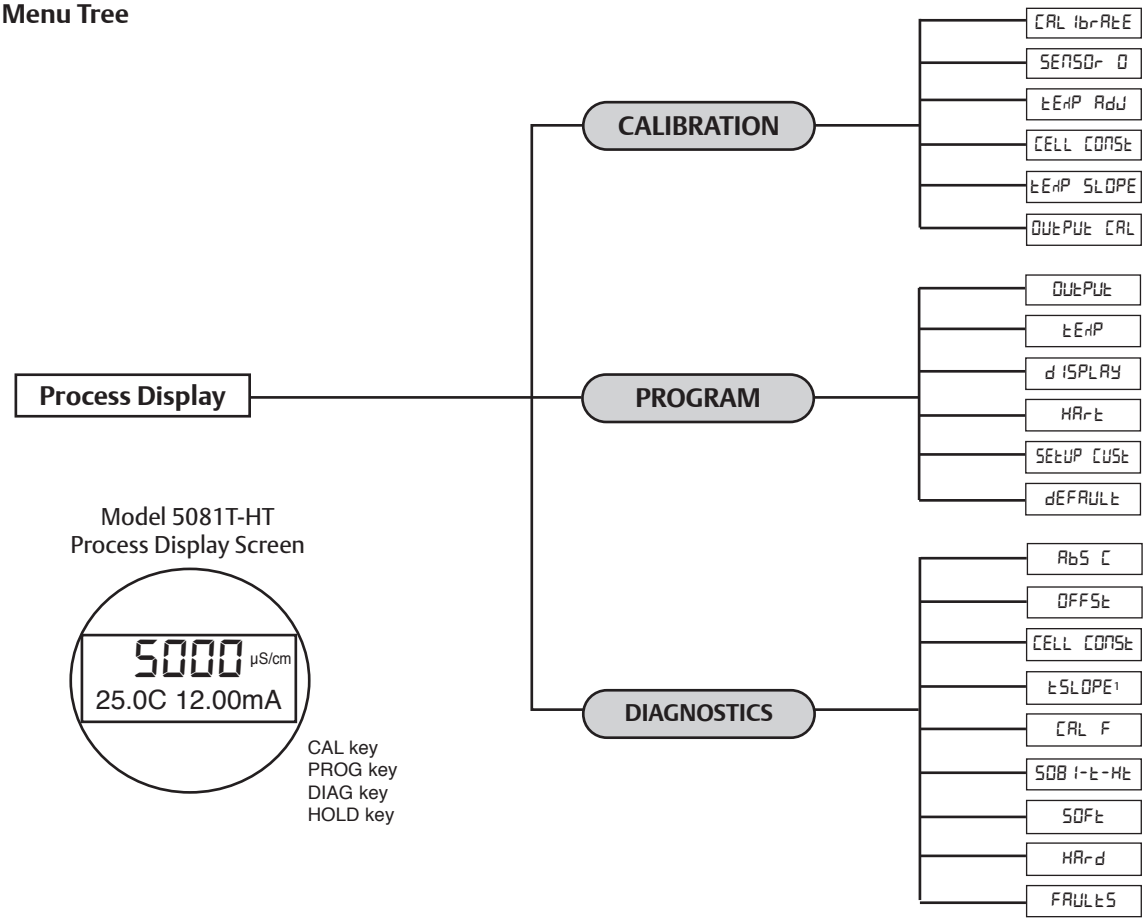
HART COMMUNICATION (Figure 3)

Figure 3 shows how HART communication can be used with the Model 5081-HT. Use HART to configure and read process variables using the Model 475 HART Communicator, a personal computer, or any other hosts that aasupport HART communication protocol. HART allows communication through to AMS.

PROGRAM MENU MNEMONICS

OUtPUt	Current output menu header
4mA	4mA current output (setpoint)
20mA	20mA current output (setpoint)
HOLd	Current output on hold
FAULt	Fault condition current output setting
dAMP	Current output dampening time
tESt	Current output test value
tEMP	Temperature menu header
tAUtO	Automatic temperature compensation
tMAN	Manual temperature compensation input
d ISPLAY	Display menu header
tYP	Conductivity measurement type
tEMP	°C / °F toggle selection
OUtPUt	Current (mA) or percent of full scale display
CodE	Security code
OFFSt	Conductance Offset value

FIGURE 4. Menu Tree

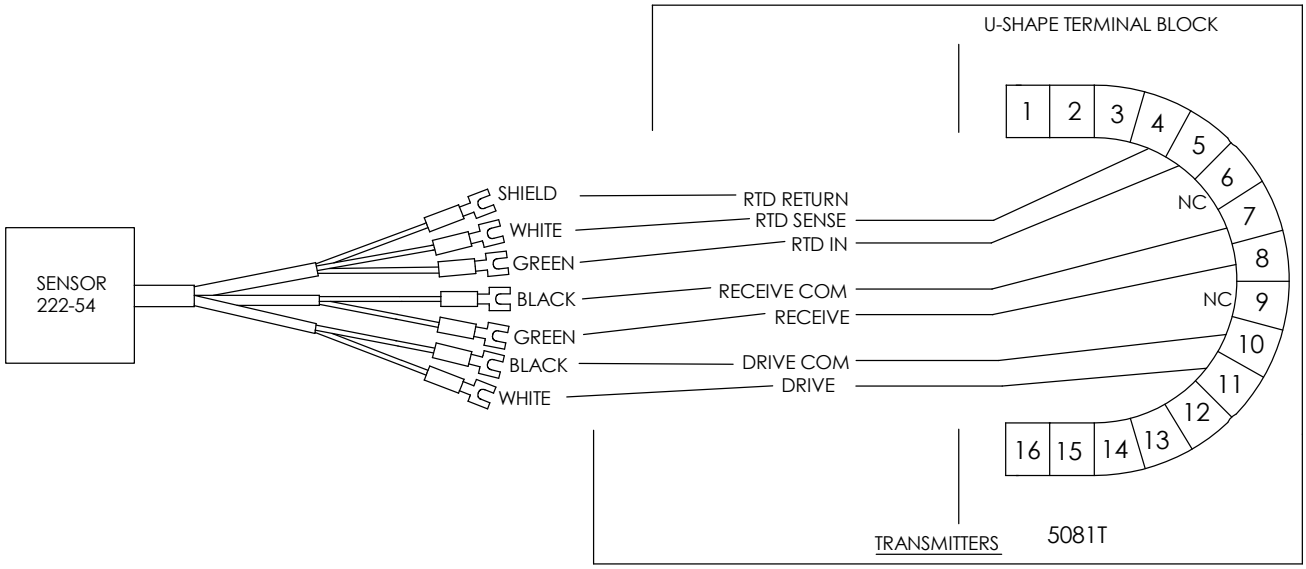


VARIABLE NAME	MNEMONIC	FACTORY SETTINGS	CUSTOMER SETTINGS
Program Menu			
Output	OUtPUt	–	_____
4 mA	4 mA	0 µS	_____
20 mA	20 mA	20 mS	_____
Hold	HOLd	21 mA	_____
Fault	FAULt	22 mA	_____
Dampening	dPn	0 samples/second	_____
Test	tESt	04.00 mA	_____
Temperature	tEMP		
Auto temperature compensation	tAUtO	on	_____
Manual temperature	tMAn	25.0°C (overridden by auto)	_____
Temperature compensation algorithm	COMP (L InEAr OR nOnE)	LInEAr	_____
Display	d ISPLAY		
Measurement type	tYP (CONdUC OR nAOH OR HCL or H2SO4L OR H2SO4H OR CUSt)	CondUC	_____
Temperature (°C or °F)	tEMP	C	_____
Output (mA or %)	OUtPUt	Cur	_____
Security Code	COdE	000	_____
Custom Curve	SEtUP	**Cust**	_____
Reference temperature	t rEF	25.0°C	_____
Calibrate Menu			
Cell constant	CELL CONSt	3.00	_____
Temperature slope	tEMP SLOPE	2.000	_____
Output Calibration	OUtPUt CAL		_____
Diagnose Menu			
Diagnose (Each segment displays the current value in the transmitter.)		**SAMPLE READINGS**	
Absolute conductivity	AbS	1000 µS	_____
Off Set	OFFSt	0.0 µS	_____
Cell constant	CELL CONSt	3.00/cm	_____
Temperature slope	tSLOPE	2.000	_____
Software version	SOFt	A02.09	_____
Hardware version	HArd	01	_____
Show fault warnings	FAULtS	none	_____

Wiring

Wire sensor as shown below in Figure 2. Keep sensor wiring separate from power wiring. For best EMI/RFI protection, use shielded output signal cable in an earth-grounded metal conduit. Refer to the sensor instruction manual for more details.

FIGURE 5. Wiring 5081T-HT



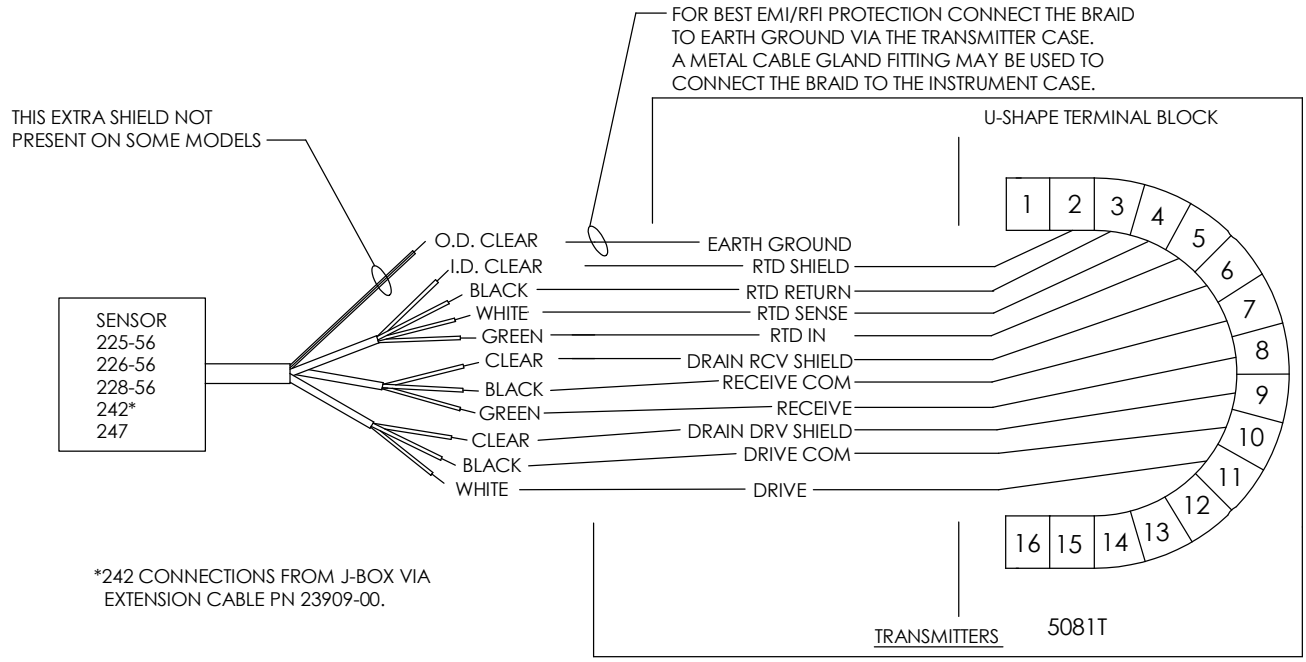
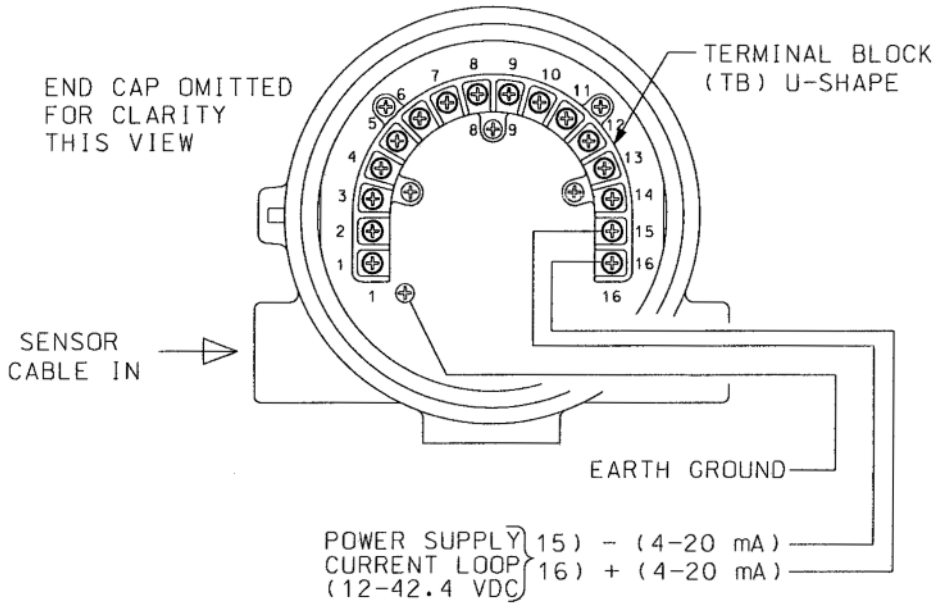


FIGURE 6. Power Supply/Current Loop Wiring for 5081T-HT



WIRING THROUGH A JUNCTION BOX

The sensor can be wired to the analyzer through a remote junction box (PN 23550-00). Wire the extension cable and sensor cable point-to-point. Refer to the sensor instruction manual for more details.

Factory-terminated (PN 23294-05) and unterminated (PN 9200276) connecting cable are available. The use of factory-terminated cable is strongly recommended. To prepare unterminated cable for use, follow the instructions in the sensor instruction manual.

For maximum EMI/RFI protection, the outer braid of the sensor cable should be connected to the outer braided shield of the extension cable. At the instrument, connect the outer braid of the extension cable to earth ground.

POWER WIRING

For general purpose areas, wire power as shown in Figure 3. For hazardous areas, please see hazardous area installation drawings.

Installation

UNPACKING AND INSPECTION

Inspect the shipping container. If it is damaged, contact the shipper immediately for instructions. Save the box. If there is no apparent damage, unpack the container. Be sure all items shown on the packing list are present. If items are missing, notify us immediately.

ROTATING THE DISPLAY

The Model 5081T-HT display can be rotated 90° left or right. Disengage the cover lock and remove the front cover. Remove the three screws holding the PCB stack and gently lift the display board. Do not disengage the ribbon cable between the display board and the CPU board. Rotate the display. The black infrared sensor will be at the top of the display.

INSTALLATION See Figure 4

1. Although the analyzer is suitable for outdoor use, do not install it in direct sunlight or in areas of extreme temperatures.
2. Install the analyzer in an area where vibrations and electromagnetic and radio frequency interference are minimized or absent.
3. Keep the analyzer and sensor wiring at least one foot from high voltage conductors. Be sure there is easy access to the analyzer.
4. The conduit connections on the sides of the 5081 housing should be sealed to prevent moisture from entering the enclosure.
5. The transmitter must not be mounted with both conduit openings at the top.

FIGURE 7. Mounting Model 5081T-HT

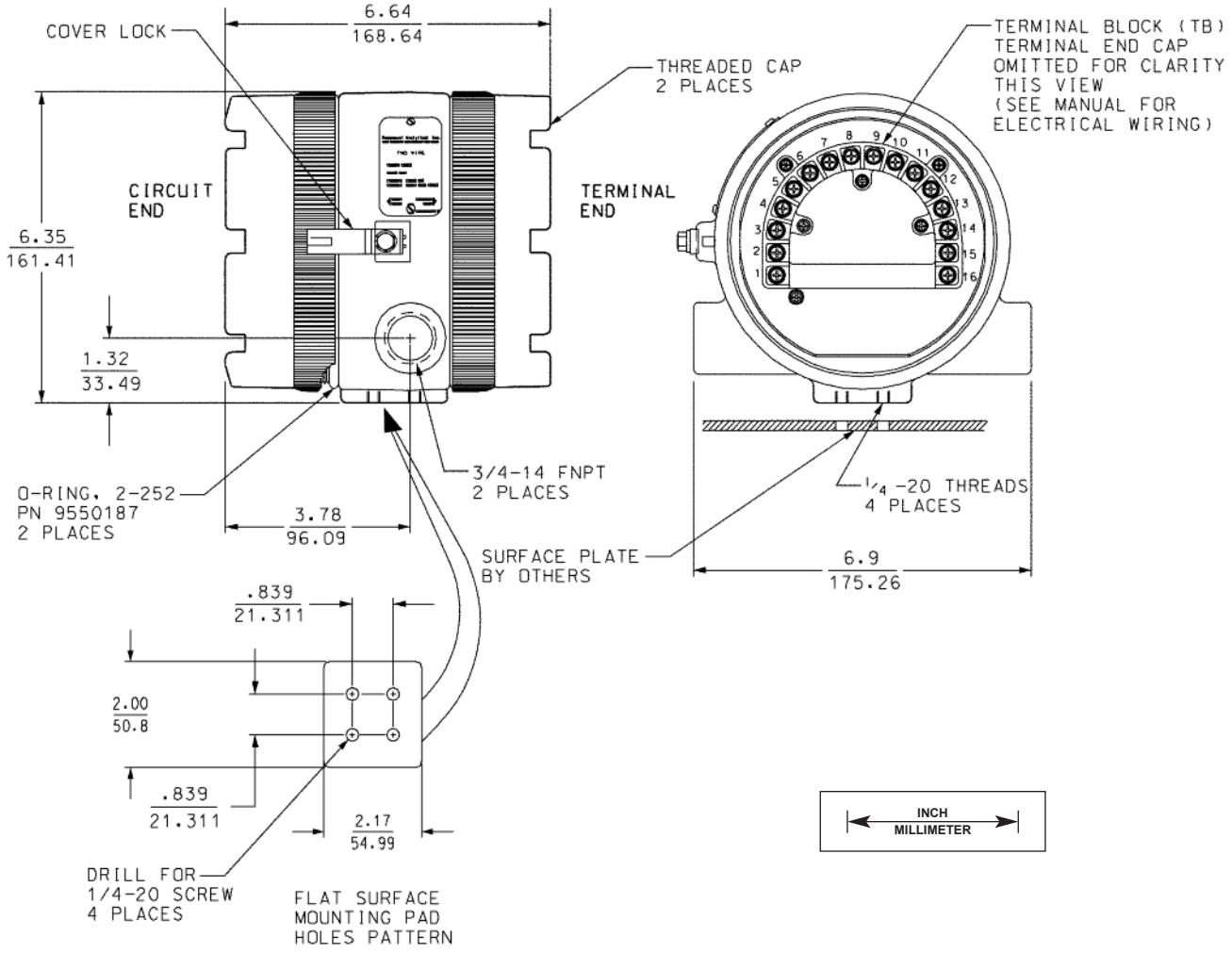


FIGURE 8. 5081T-HT-73 Label

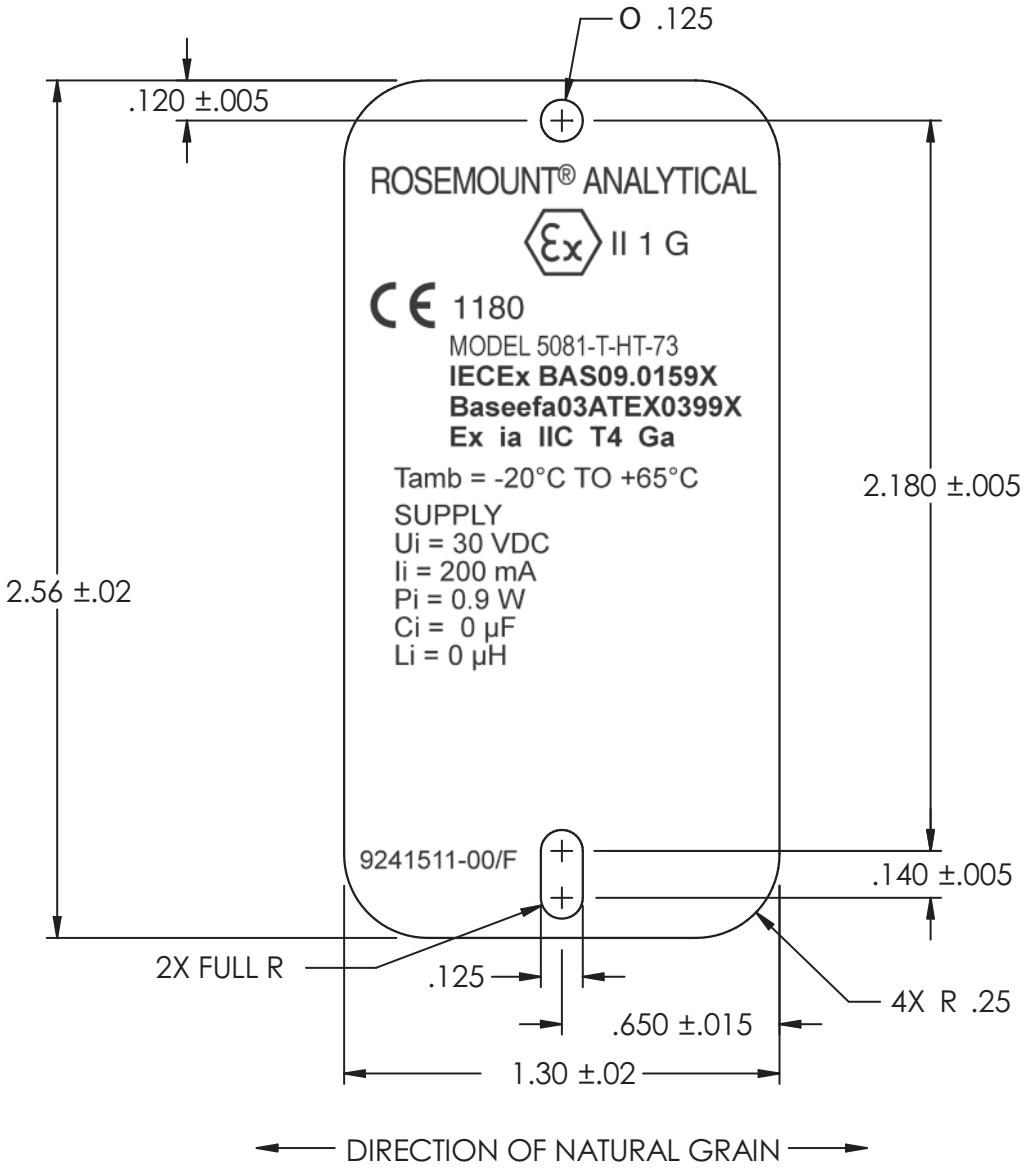


FIGURE 9. 5081-T-HT Entity Parameters for Hazardous Area Installation

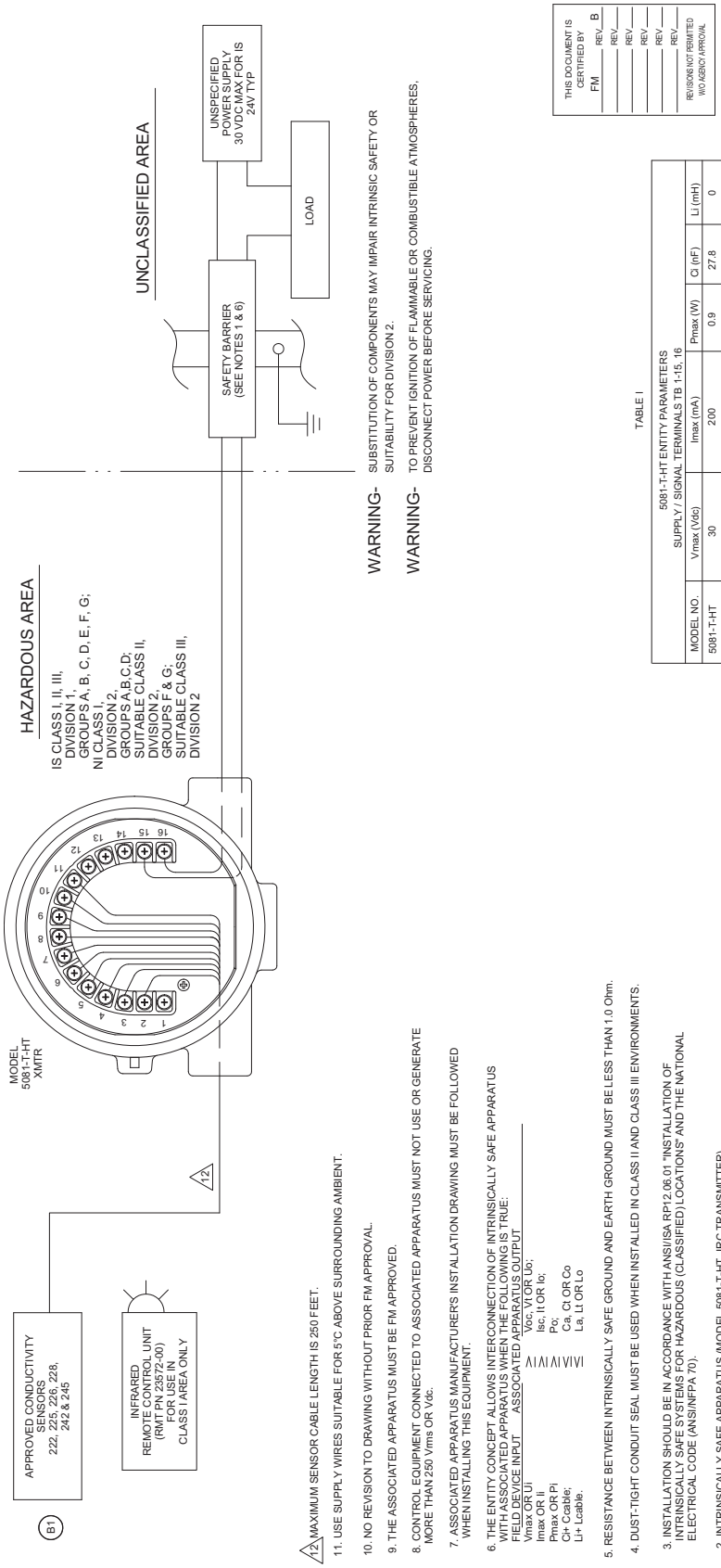


FIGURE 10. 5081-T-HT-67 FM Hazardous Area Installation

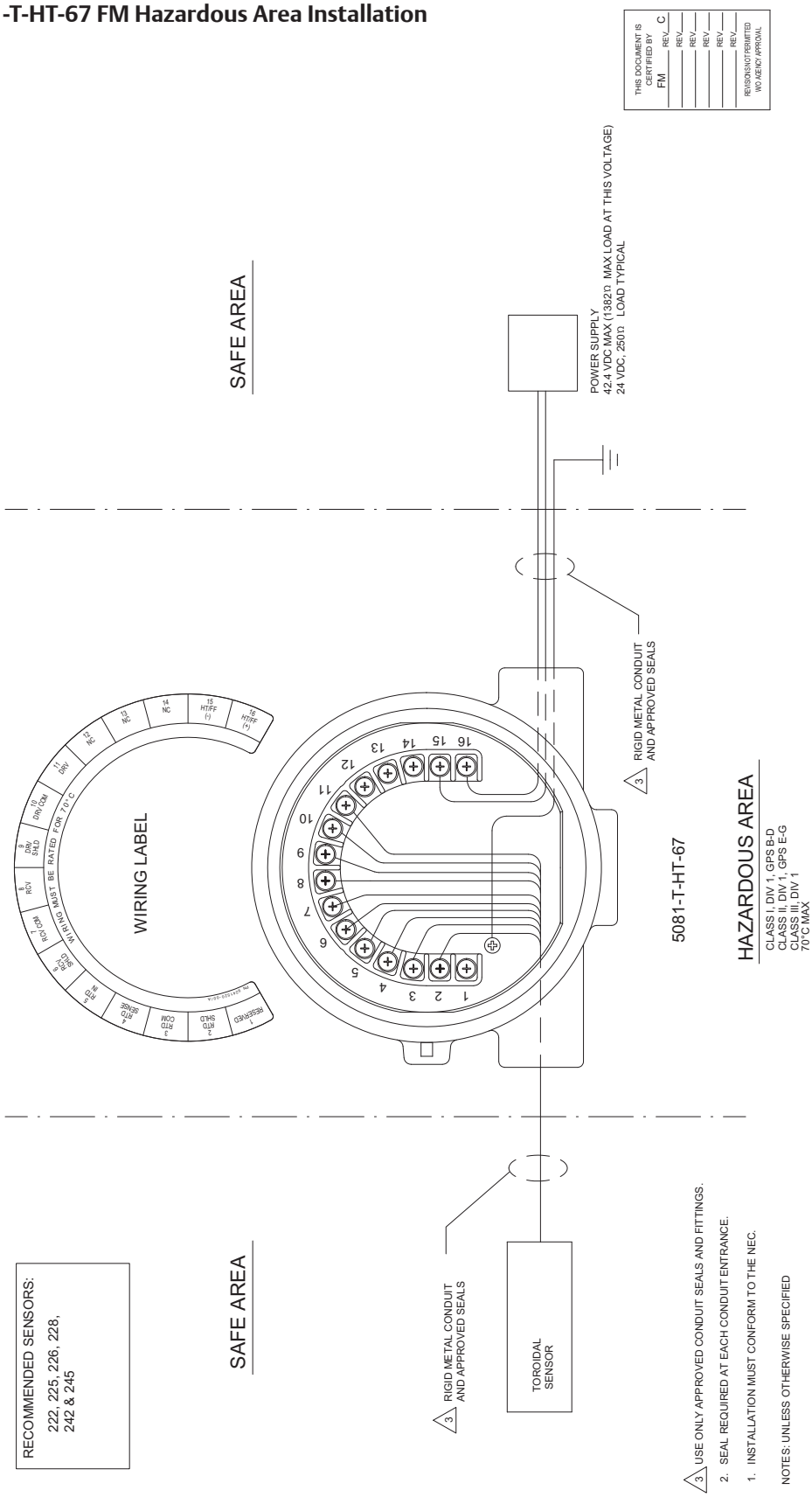


FIGURE 11. 5081-T-FF Entity Parameters for Hazardous Area Installation

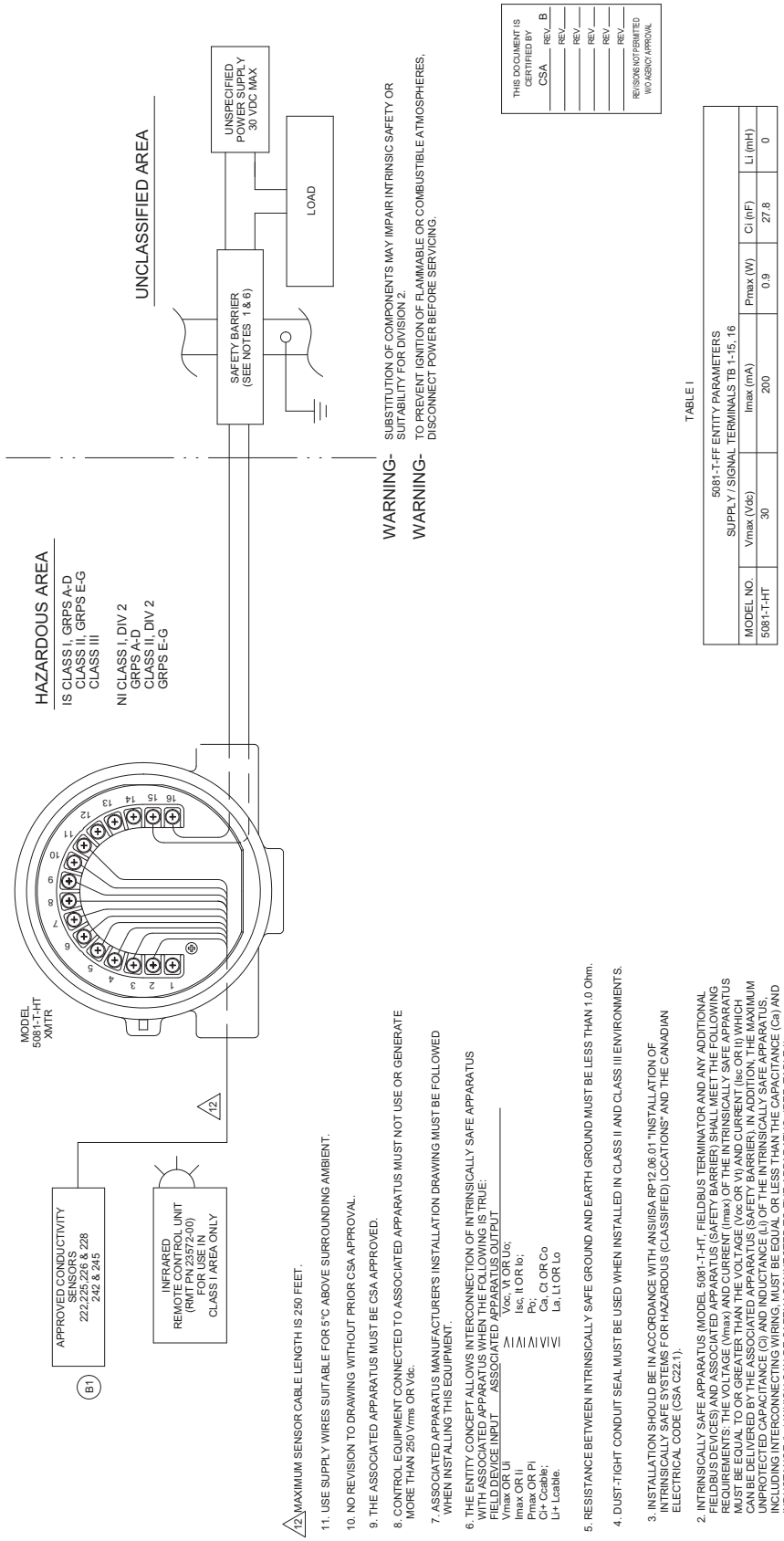


TABLE I

5081-T-FF ENTITY PARAMETERS SUPPLY / SIGNAL TERMINALS TB 1-15, 16					
MODEL NO.	Vmax (Vdc)	Imax (mA)	Pmax (W)	Ci (nF)	Li (mH)
5081-T-HT	30	200	0.9	27.8	0

1. ANY SINGLE SHUNT ZENER DIODE SAFETY BARRIER APPROVED BY CSA HAVING THE FOLLOWING OUTPUT PARAMETERS:
   SUPPLY/SIGNAL TERMINALS TB1-15, 16

   Voc OR Vt NOT GREATER THAN 30 V
   Isc OR It NOT GREATER THAN 200 mA
   Pmax NOT GREATER THAN 0.9 W

NOTES: UNLESS OTHERWISE SPECIFIED

2. INTRINSICALLY SAFE APPARATUS (MODEL 5081-T-HT, FIELDBUS TERMINATOR AND ANY ADDITIONAL FIELDBUS DEVICES) AND ASSOCIATED APPARATUS (SAFETY BARRIER) SHALL MEET THE FOLLOWING REQUIREMENTS: THE VOLTAGE (Vmax) AND CURRENT (Imax) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc OR Vt) AND CURRENT (Isc OR It) WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS (SAFETY BARRIER). IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF EACH APPARATUS (FIELDBUS DEVICE) INCLUDING INTERCONNECTING WIRING, MUST BE EQUAL OR LESS THAN THE CAPACITANCE (Ca) AND INDUCTANCE (La) WHICH CAN BE SAFELY CONNECTED TO THE APPARATUS. (REF. TABLE I).

3. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE CANADIAN ELECTRICAL CODE (CSA C22.1).

4. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

5. RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 Ohm.

6. THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS WITH ASSOCIATED APPARATUS WHEN THE FOLLOWING IS TRUE:

FIELD DEVICE INPUT	≥	ASSOCIATED APPARATUS OUTPUT
Vmax OR Ui	≥	Voc, Vt OR Uo;
Imax OR Ii	≥	Isc, It OR Io;
Pmax OR Pi	≥	Po;
Ci+ Ccable;	≥	Ca, Ci OR Co
Li+ Lcable.	≥	La, Li OR Lo

7. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

8. CONTROL EQUIPMENT CONNECTED TO ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms OR Vdc.

9. THE ASSOCIATED APPARATUS MUST BE CSA APPROVED.

10. NO REVISION TO DRAWING WITHOUT PRIOR CSA APPROVAL.

11. USE SUPPLY WIRES SUITABLE FOR 5°C ABOVE SURROUNDING AMBIENT.

12 MAXIMUM SENSOR CABLE LENGTH IS 250 FEET.

Maintenance

OVERVIEW

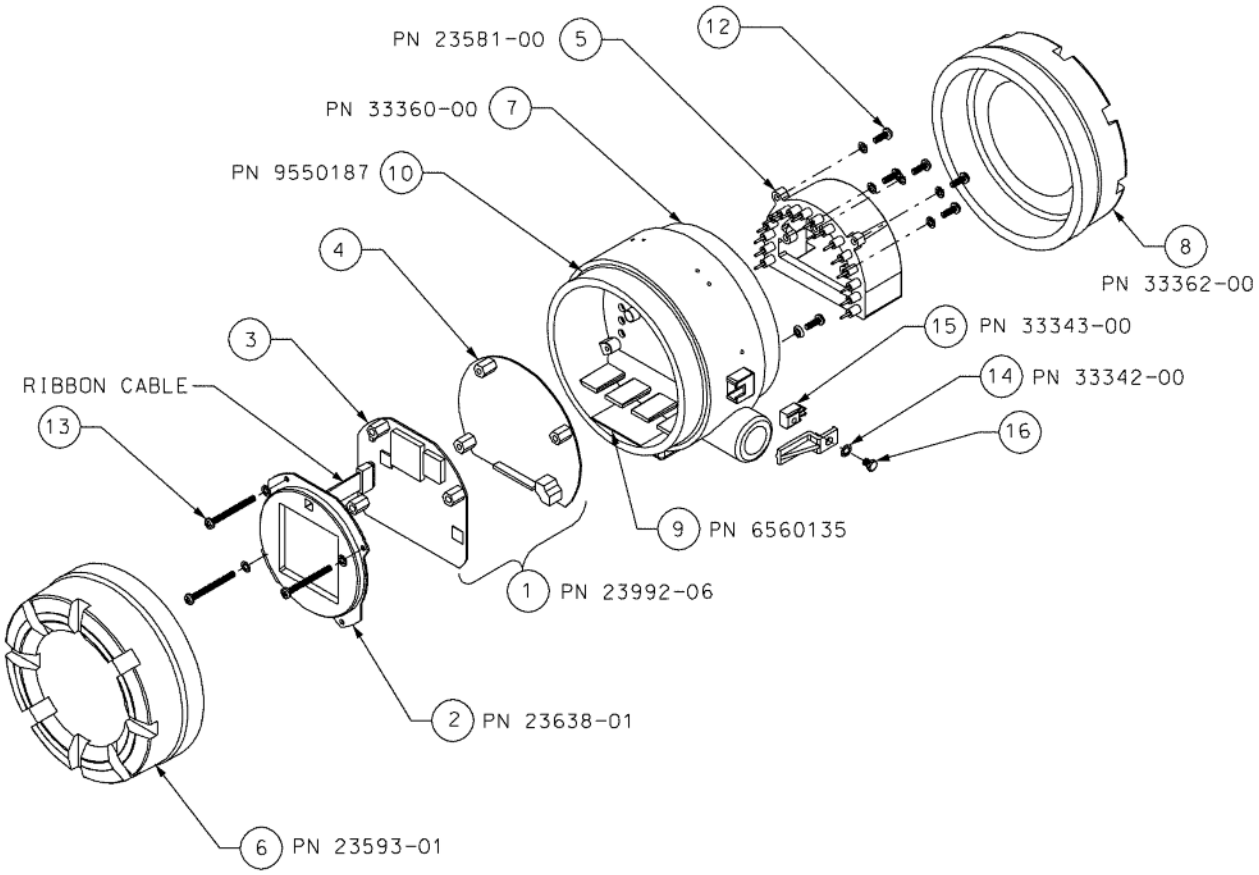
This section gives general procedures for routine maintenance of the 5081-T transmitter. The transmitter needs almost no routine maintenance.

TRANSMITTER MAINTENANCE

Periodically clean the transmitter window with household ammonia or glass cleaner. The detector for the infrared remote controller is located behind the window at the top of the transmitter face. The window in front of the detector must be kept clean.

Most components of the transmitter are replaceable. Refer to figure below and table on next page for parts and part numbers.

FIGURE 13. Exploded View of Model 5081-T-HT Transmitter



Three screws (part 13 in the drawing) hold the three circuit boards in place. Removing the screws allows the display board (part 2) and the CPU board (part 3) to be easily removed. A ribbon cable connects the boards. The cable plugs into the CPU board and is permanently attached to the display board. A 16 pin and socket connector holds the CPU and analog (part 4) boards together. Five screws hold the terminal block (part 5) to the center housing (part 7), and the 16 pins on the terminal block mate with 16 sockets on the back side of the analog board. Use caution when separating the terminal block from the analog board. The pin and socket connection is tight.

Table 1. Replacement Parts for Model 5081-T-HT Transmitter

Location in drawing	PN	Description	Shipping Weight
1	23992-06	PCB stack consisting of the CPU (part 3) and analog (part 4) boards, display board is not included, CPU and analog boards are factory-calibrated as a unit and cannot be ordered separately	1 lb/0.5 kg
2	23638-01	LCD display PCB	1 lb/0.5 kg
5	33337-02	Terminal block	1 lb/0.5 kg
6	23593-01	Enclosure cover, front with glass window	3 lb/1.5 kg
7	33360-00	Enclosure, center housing 4 lb/1.5 kg	
8	33362-00	Enclosure cover, rear	3 lb/1.0 kg
9	6560135	Desiccant in bag, one each 1 lb/0.5 kg	
10	9550187	O-ring (2-252), one, front and rear covers each require an O-ring	1 lb/0.5 kg
12	note	Screw, 8-32 x 0.5 inch, for attaching terminal block to center housing	*
13	note	Screw, 8-32 x 1.75 inch, for attaching circuit board stack to center housing	*
14	33342-00	Cover lock	1 lb/0.5 kg
15	33343-00	Locking bracket nut	1 lb/0.5 kg
16	note	Screw, 10-24 x 0.38 inch, for attaching cover lock and locking bracket nut to center housing	*

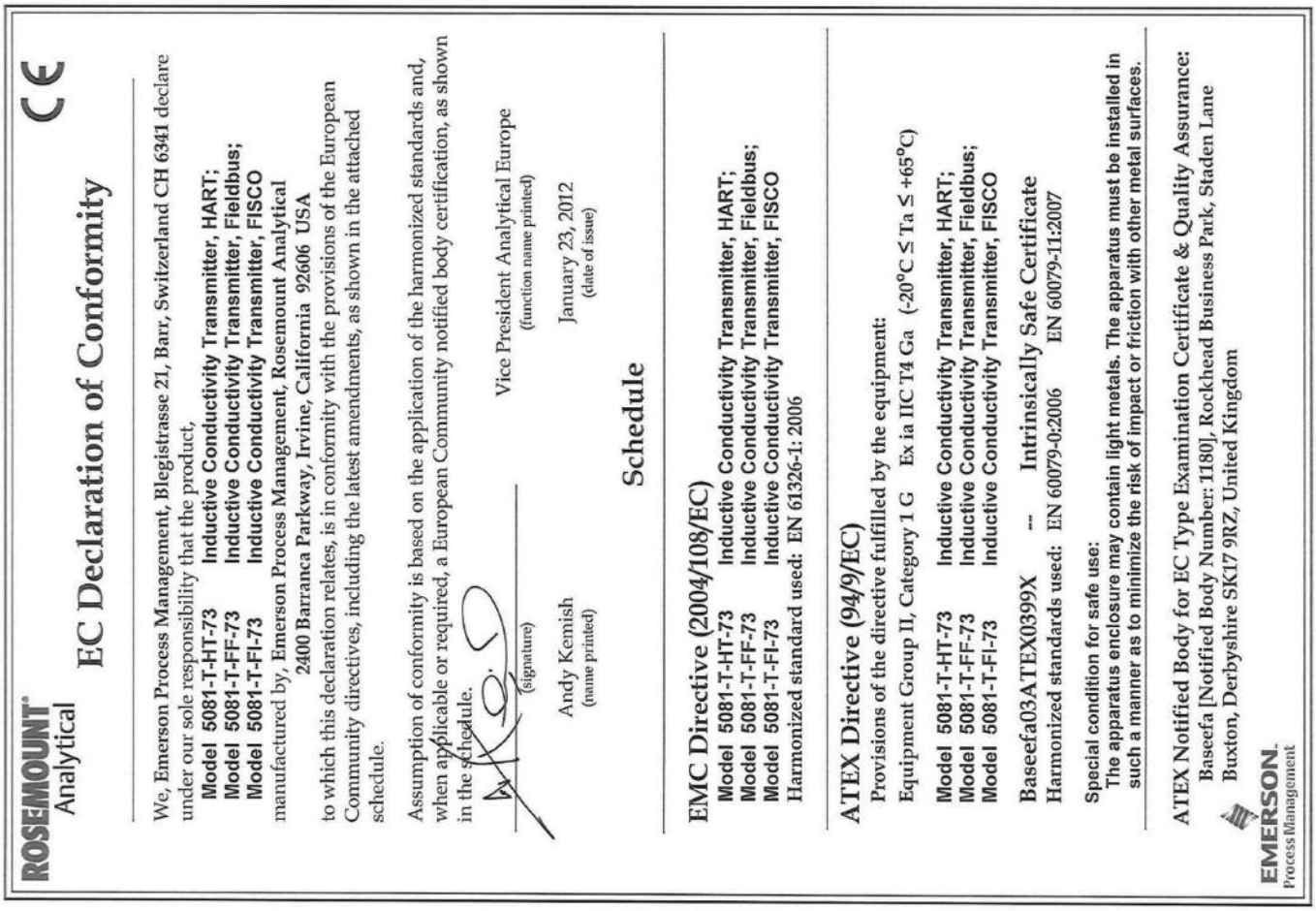
Engineering Specifications

QUICK-START

1. On the Remote, press PROG, NEXT, NEXT, ENTER.
2. Use the arrow buttons to select **COnduc** (conductivity), **nAOH** (Sodium Hydroxide 0-15%), **HCL** (Hydrochloric Acid 0-16%), **H2SO4L** (Sulfuric Acid 0-30%), **H2SO4H** (Sulfuric Acid 95-99.99%), or **CuSt** (custom curve) mode. Press ENTER. If you chose **CuSt**, continue with step 3. If you chose **COnduc** or one of the preprogrammed % concentration modes, skip step 3 and go to step 4.
3. **If you selected CuST**, you will see the Setup Custom screen. To move to the custom curve configuration menu, press ENTER. You will automatically return to this same Setup Custom screen after configuration is complete. To continue transmitter display programming, press NEXT in the Setup Custom screen.
4. Use the arrow keys to toggle temperature units between Celsius and Farenheit.
5. Press ENTER then RESET.
6. Press PROG, ENTER.
7. Use the arrow buttons to enter the 4 mA value. Press ENTER.
8. Use the arrow buttons to enter the 20 mA value. Press ENTER then RESET.
9. Press PROG, NEXT, ENTER.
10. Use the arrow key to toggle **tAutO** to On or OFF to select using either the process temperature (**tAutO** = On) or a manual temperature (**tAutO** = OFF). Press ENTER. If you selected **tAutO** = OFF, you will be prompted to enter the manual temperature; use the arrow keys, then press ENTER.
11. If you selected **CondUC** in step 2, you will see a **COMP** (Temperature Compensation type) screen. Use the arrow keys to select desired temperature compensation: **LinEAr** (linear) or **nOnE** (raw or uncompensated conductivity). Press ENTER. If you are in **LinEAR** mode, you can now enter a particular temperature slope (default is 2%/degC), then press ENTER to apply the slope.
12. Press RESET.
13. Press CAL, NEXT, NEXT, NEXT, ENTER.
14. Use the arrow buttons to enter the cell constant of the sensor. Press ENTER, then EXIT.
15. To “zero” the sensor in air, press CAL, NEXT, ENTER.
16. Hold the sensor in air to zero. Press ENTER, then EXIT.
17. If you are measuring % concentration (**nAOH, HCL, H2SO4L,** or **H2SO4H**) or custom curve (**CuSt**), quick start is complete; proceed to step 20.
18. If you are measuring conductivity (**CondUC**), then standardize the sensor by placing the sensor in a solution of known conductivity value. Press CAL, ENTER.
19. Use the arrow buttons to enter the current conductivity value of the solution. Press ENTER.
20. Press RESET.

TO RESET TRANSMITER TO FACTORY DEFAULT SETTINGS:

1. Press PROGRAM, NEXT, NEXT, NEXT, NEXT, NEXT. The screen should say **“dEFAULt”**. Press ENTER.
2. Use the arrow keys to toggle between nO (retain your configuration and calibration settings) and **YES** (restore factory default settings to all variables).
3. Press ENTER, then EXIT.



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CE

EC Declaration of Conformity

We, Emerson Process Management, Blegistrasse 21, Barr, Switzerland CH 6341 declare under our sole responsibility that the product,

Model 5081-T-HT-73 **Inductive Conductivity Transmitter, HART;**
Model 5081-T-FF-73 **Inductive Conductivity Transmitter, Fieldbus;**
Model 5081-T-FI-73 **Inductive Conductivity Transmitter, FISCO**

manufactured by, Emerson Process Management, Rosemount Analytical
2400 Barranca Parkway, Irvine, California 92606 USA

to which this declaration relates, is in conformity with the provisions of the European Community directives, including the latest amendments, as shown in the attached schedule.

Assumption of conformity is based on the application of the harmonized standards and, when applicable or required, a European Community notified body certification, as shown in the schedule.

Vice President Analytical Europe
(function name printed)

(signature)

Andy Kemish
(name printed)

January 23, 2012
(date of issue)

Schedule

EMC Directive (2004/108/EC)

Model 5081-T-HT-73 **Inductive Conductivity Transmitter, HART;**
Model 5081-T-FF-73 **Inductive Conductivity Transmitter, Fieldbus;**
Model 5081-T-FI-73 **Inductive Conductivity Transmitter, FISCO**
Harmonized standard used: EN 61326-1: 2006

ATEX Directive (94/9/EC)

Provisions of the directive fulfilled by the equipment:
Equipment Group II, Category 1 G Ex ia IIC T4 Ga ($-20^{\circ}C \leq Ta \leq +65^{\circ}C$)

Model 5081-T-HT-73 **Inductive Conductivity Transmitter, HART;**
Model 5081-T-FF-73 **Inductive Conductivity Transmitter, Fieldbus;**
Model 5081-T-FI-73 **Inductive Conductivity Transmitter, FISCO**

Baseefa03ATEX0399X -- Intrinsically Safe Certificate
Harmonized standards used: EN 60079-0:2006 EN 60079-11:2007

Special condition for safe use:
The apparatus enclosure may contain light metals. The apparatus must be installed in such a manner as to minimize the risk of impact or friction with other metal surfaces.

ATEX Notified Body for EC Type Examination Certificate & Quality Assurance:
Baseefa [Notified Body Number: 1180], Rockhead Business Park, Staden Lane
Buxton, Derbyshire SK17 9RZ, United Kingdom

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CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001:2008 DNV

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